

Way to Go, Seattle!

'One-Less-Car' Demonstration Study



APPENDIX C: Report on Results Fall 2002 June 5, 2003

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Introduction

Executive Assistance was contracted to provide data analysis for the 2002 round of the ***Way to Go, Seattle*** “One-Less-Car” Demonstration Study.

Certain limitations should be suggested regarding the importance of different information and relationships in the data. Executive Assistance was not retained to create the study and develop its methodology and does not offer specific conclusions with respect to the data. Rather, the data has been analyzed and presented at the request and direction of the client. The significance of the conclusions and the statistical confidence in correlation and causation are unknown and could only be addressed by further analysis.

Much of the data analyzed is subjective data, based on the beliefs, attitudes, and intentions of the participants. The City is aware that many people believe the cost of their second car is worth the convenience. The Study, in part, hopes to show that this belief is not true by helping people recognize the true cost of owning, operating, and maintaining a vehicle. As the City has learned, many people are surprised at the actual cost of owning that extra car, and have become open to exploring travel alternatives with or without any additional financial incentive other than savings realized through reducing car ownership.

In short, statistical conclusions that appear in this working paper should be considered tentative. That concern aside, the City has demonstrated that the sample population believes in the benefits being promoted, including lower cost, lower pollution levels, and lower congestion levels. The positive results the “One-Less-Car” Demonstration Study continues to achieve suggest that further study of the data and continued research will prove interesting and useful.

Note: In the following pages, the term “Baseline Period” refers to the first three weeks of the study period where the 41 participating households traveled as they normally do. The term “Test Period” refers to the following nine weeks of the study where households were required to park one car (designated “Car 0”) for the duration of the study. In most cases this meant the households were reduced to using only one car, though seven of the 41 households gave up the use of their only car.

Graphs of Various Transportation Relationships and Comparisons

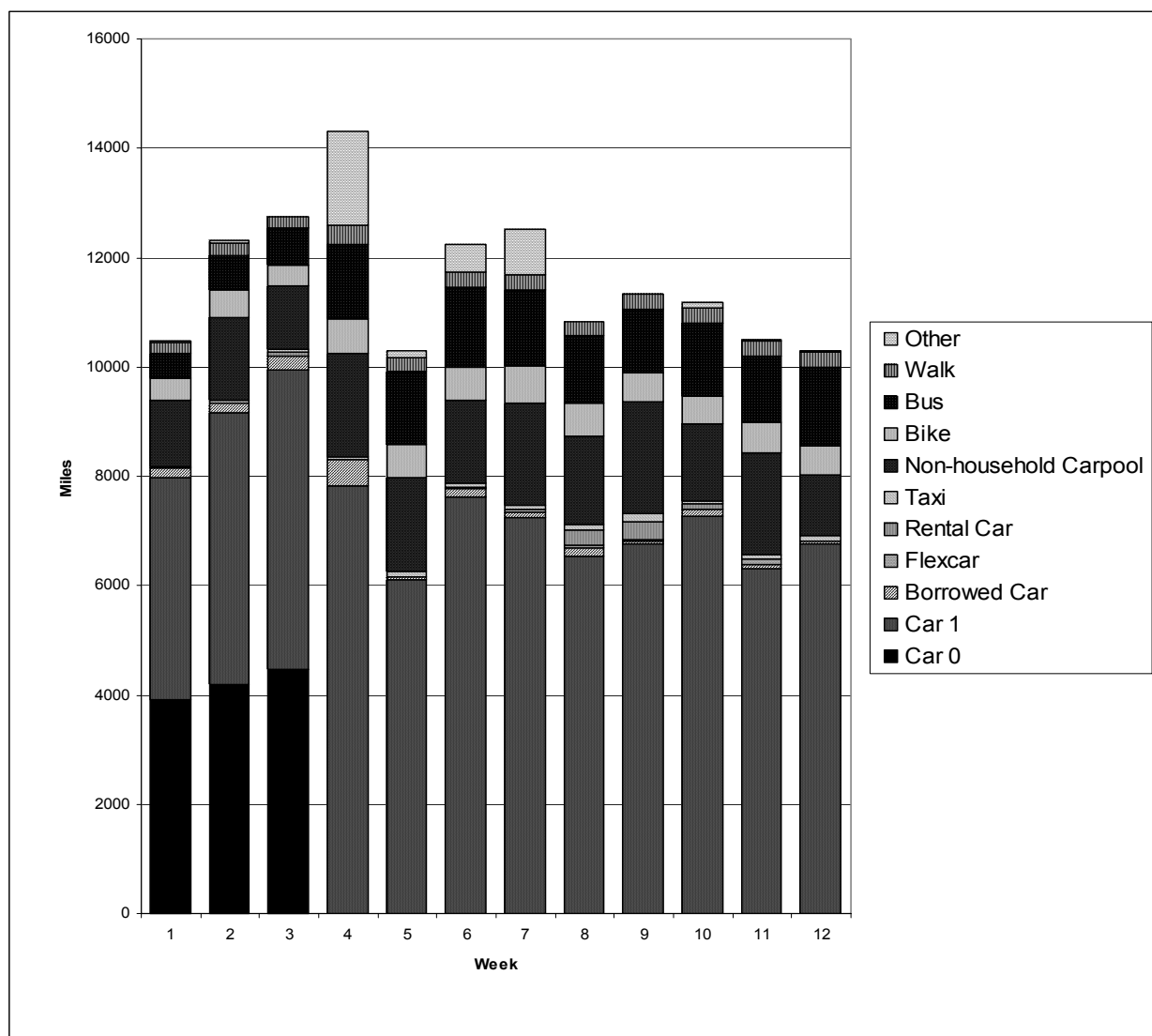


Figure 1: Miles Traveled, All Modes

Figure 1 shows a summary of transportation choices throughout the study. The transition from the baseline period (weeks 1 through 3) to the test period (weeks 4 through 12) can clearly be seen: Although Car 0 is removed after week 3, total miles traveled by all modes do not decrease -- in fact, the first week of the test period was the most heavily traveled week of the study. However, total miles driven by single occupant vehicles (Car 0, Car 1, Borrowed Car, Flexcar, Rental Car) of all types do decrease in the test period compared to the baseline. Figure 1 shows that the participants shifted much of their Car 0 travel to Car 1. Bus utilization also increased in the test period. The remaining modes of transportation show no clear change. "Other" was used by participants to track miles traveled by modes of transportation that are not specifically denoted, e.g. ferry rides. See David Hamilton's travel log on 11/14/02 for an example.

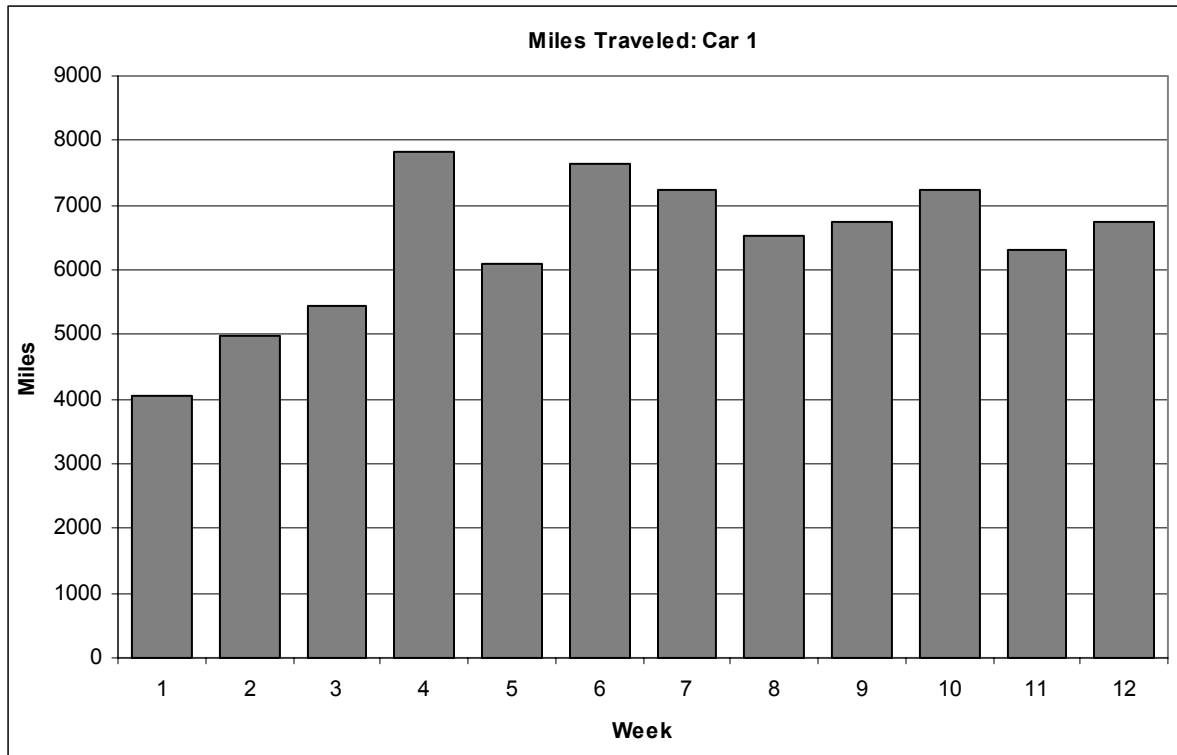


Figure 2: Miles Traveled, Car 1

Week 4, the first week of the test period, is marked by a jump in usage of Car 1. As participants reduced their total travel and explored other modes of transportation, Car 1 usage throughout the test period of the study averaged a slightly lower level than in week 4, but was significantly higher than in the baseline period. Car 1 usage in the test period, though higher than in the baseline, was lower than the combined usage of Car 0 and Car 1 in the baseline.

(It should be noted that several participants mistakenly entered mileage for a Car 2. None of the participants actually had a Car 2 and after some research, the mileage was added to the totals for Car 1.)

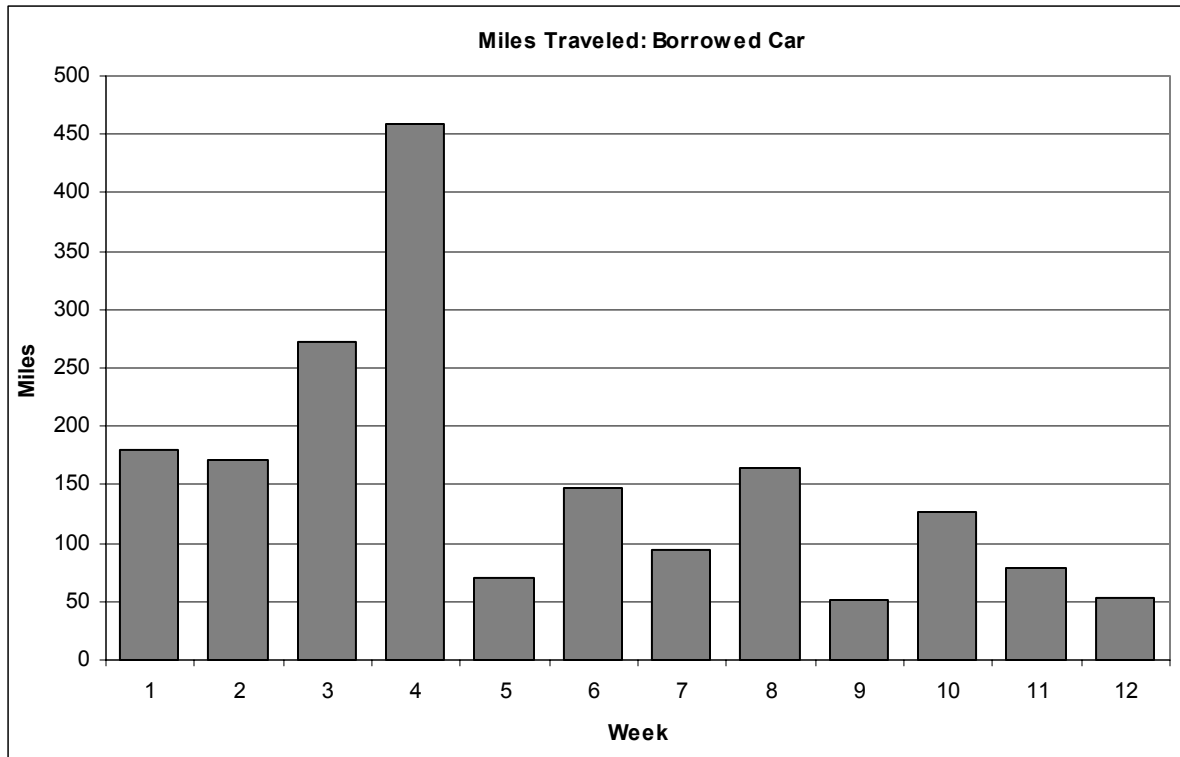


Figure 3: Miles Traveled, Borrowed Car

An increase in borrowed car usage occurs in week 4 and is due to the fact that the Dion-Yang household borrowed a car to go on a one-time trip to Mt. St. Helens. If this were to be screened out, borrowed car miles for week 4 would drop to around 100 miles, consistent with other weeks. One should note, however, that, following week 4, the average borrowed-car utilization in the test period was noticeably lower than it was in the baseline period.

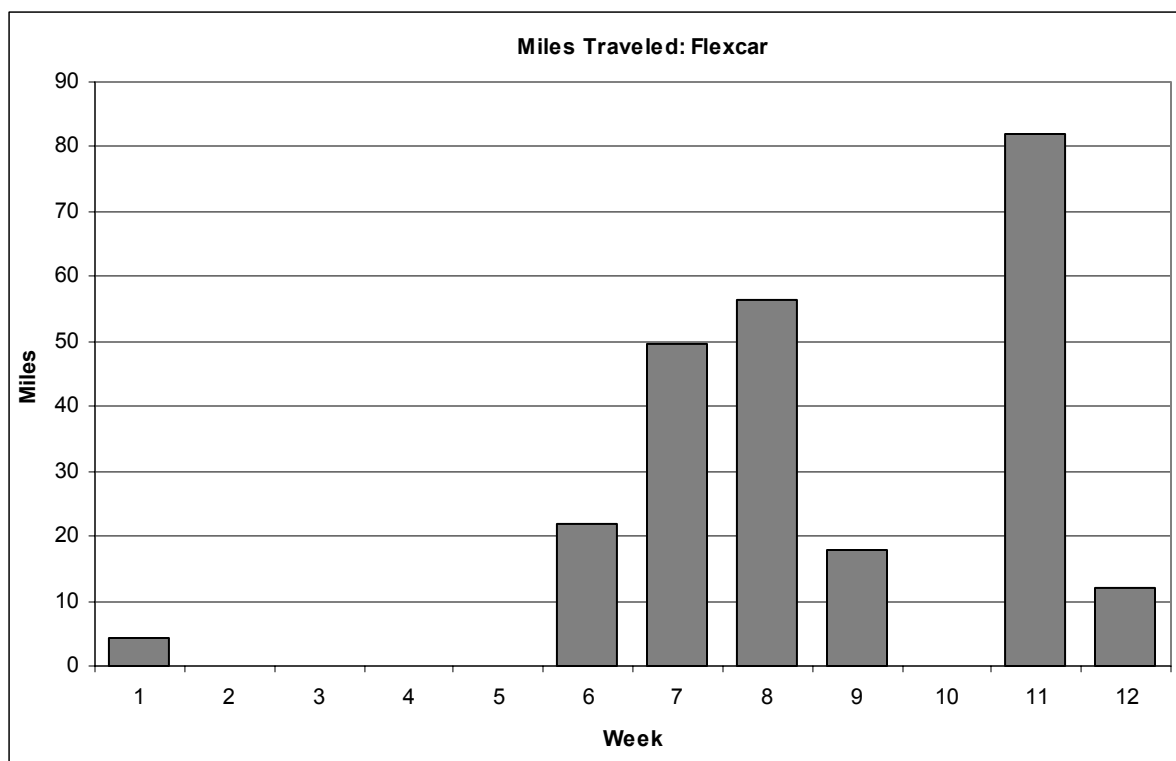


Figure 4: Miles Traveled, Flexcar

It is difficult to draw any conclusions from Figure 4, because the total miles traveled by Flexcar are so few and the weekly totals are so variable. However, the fact that the Flexcar program was utilized almost exclusively in the test period suggests that some participants may have turned to Flexcar as a way to compensate for the loss of Car 0. The relatively negligible use of Flexcar (and Borrowed Car in the previous Figure) in the test periods, combined with little reduction in the number of trips and mileage traveled when compared to baseline data, suggest that the need for a second car is not strong in the participating households.

The relatively low amount of Flexcar usage magnifies its week-to-week variability. All of week 11's usage is by the Montgomery household (a one car households who gave up their only car for the study), who switched to using a Flexcar for day-to-day transportation needs for a two-day period. In week 7, the Montgomery household once again used Flexcar for a two-day period, while the Campbell household (another one car households who gave up their only car for the study) used Flexcar for three days; both drivers used it for routine trips. In week 8, four drivers elected to use Flexcar, again for routine transportation needs. Thus the decisions of one or two households greatly influence the total trend.

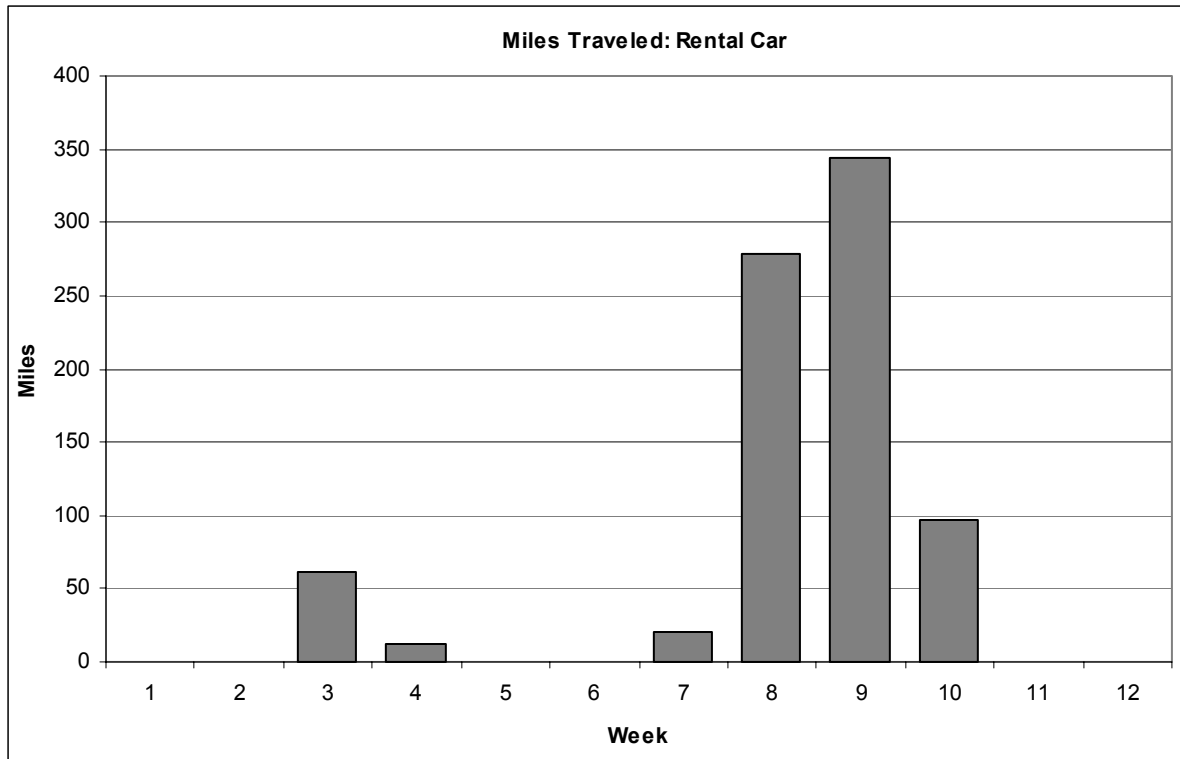


Figure 5: Miles Traveled, Rental Car

Rental car usage appears to have increased slightly by the absence of Car 0. However, in many weeks during the test period, there was no rental car usage at all, which would indicate that participants, for the most part, did not need a second car.

As with the Flexcar usage, the choices of a single household could strongly influence the trend in rental car usage. In week 8, two households comprised most of the rental-car usage. The Williams-Summers household was lent a rental car by her insurance company while their car was being repaired, and the Hall-Thames household rented a car for a day trip. Week 9's usage was also almost entirely due to two households (Williams-Summers and Ogden), and in both cases a car was rented while the participants' own vehicles were being repaired.

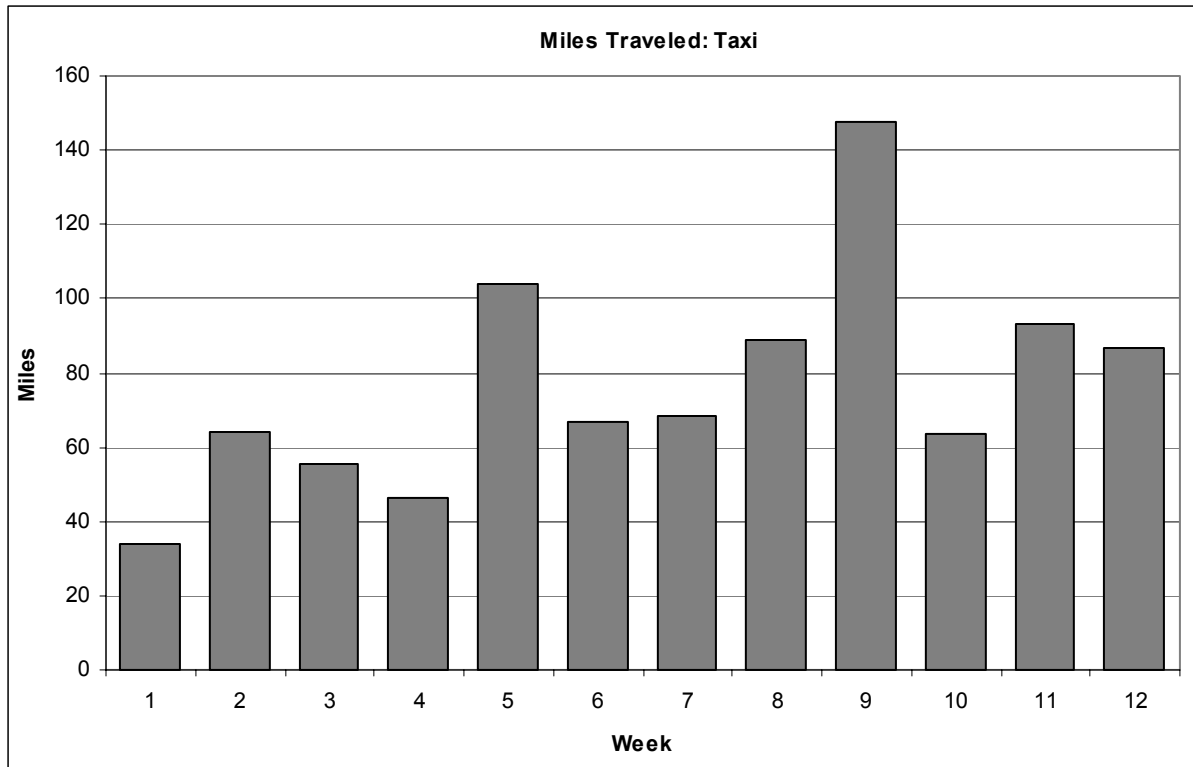


Figure 6: Miles Traveled, Taxi

Taxi usage showed a modest increase in the test period, as was expected, but not in a large enough amount to compensate for absence of Car 0. A slight spike occurs in week 9 due to the fact the Hendrickson-Kurtti household took the taxi back from the airport and there was also higher-than-normal usage by the Hamilton, Lawrence, and Werner-O'Neill households.

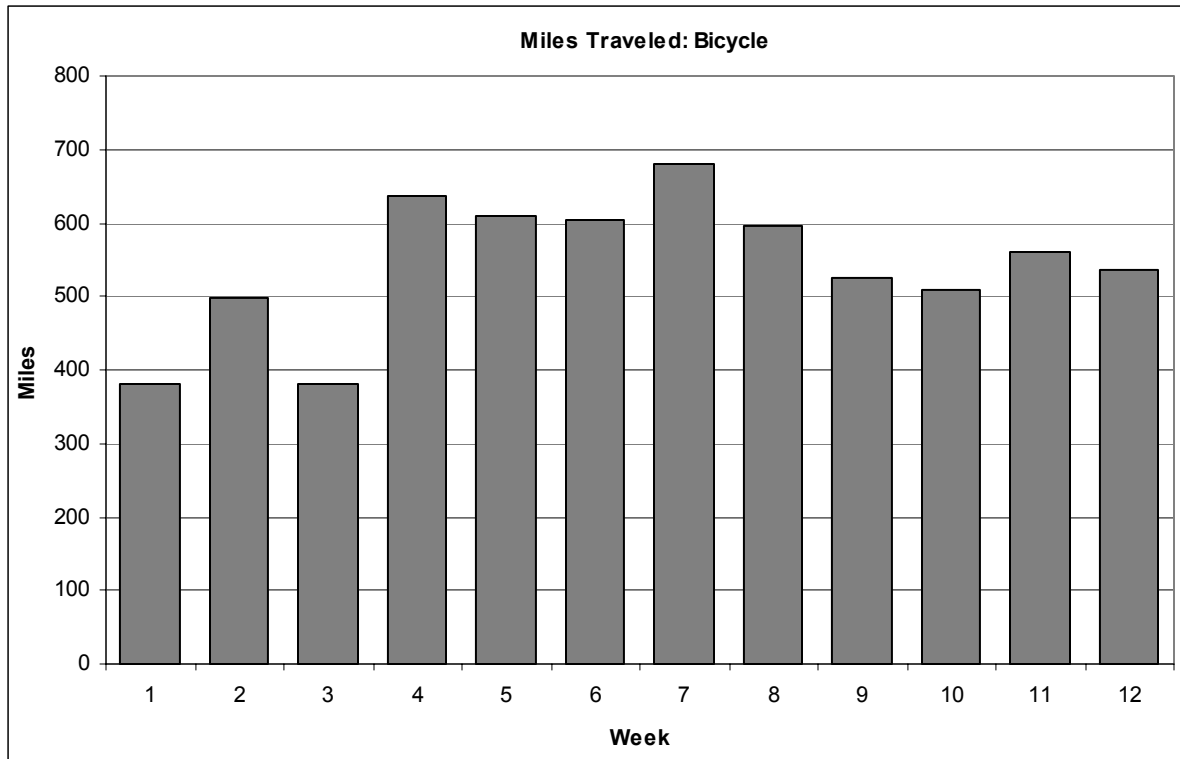


Figure 7: Miles Traveled, Bicycle

Like Car 1 (see Figure 2), bicycle usage also shows a significant increase in week 4, followed by slightly lower usage throughout the rest of the test period. Figure 7 suggests that participants shifted some of their Car 0 usage to bicycles, although the totals for weeks 10 and 12 are not much higher than week 2. In light of the fact that total miles traveled for all modes were lower in weeks 10 and 12 than in Week 2 (see Figure 1), one may still conclude that travel by bicycle increased in the test period compared to the baseline period (by an average of 163 miles per week or 38%).

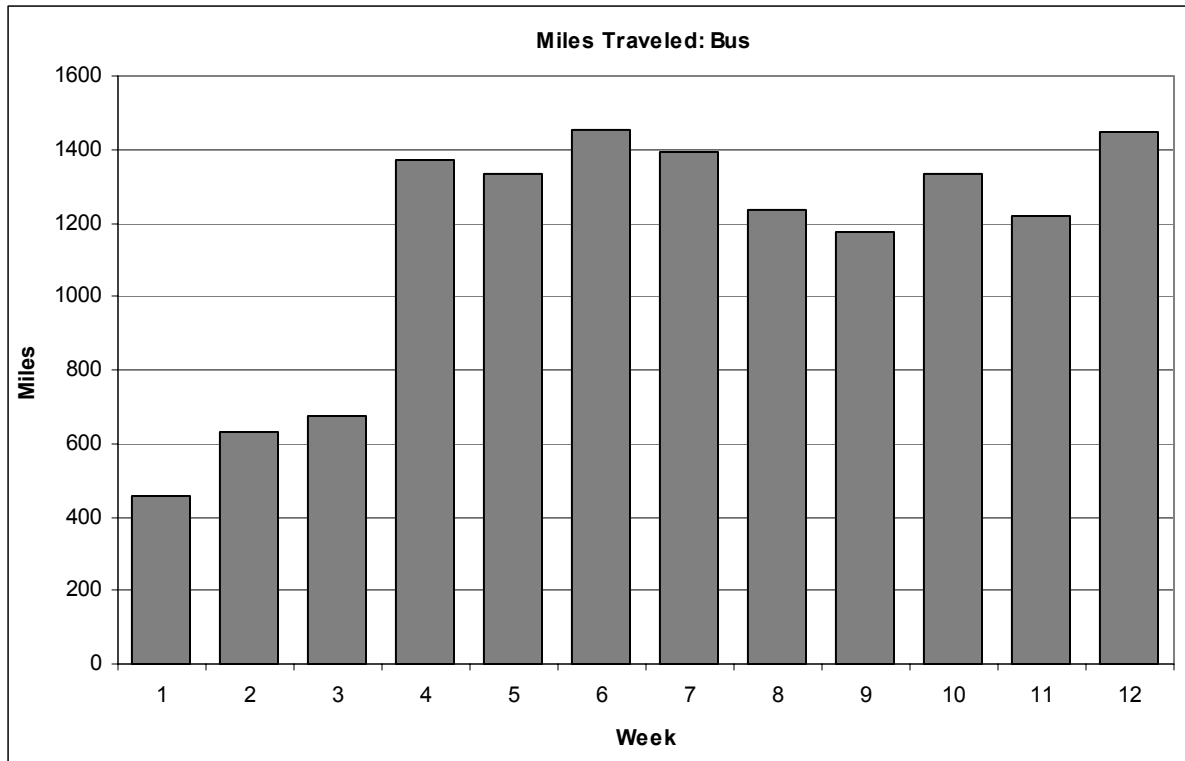


Figure 8: Miles Traveled, Bus

Figure 8 suggests that participants turned to buses as one of the main alternatives to using their primary car. Once Car 0 was removed, bus travel more than doubled and remained at its increased level for the rest of the test period. Bus travel increased in the test period compared to the baseline period by an average of 739 miles per week or 125%.



Figure 9: Miles Traveled, Walking

The amount of miles walked spiked in week 4, which is consistent with previous alternative modes of transportation. It is unclear whether this is because the participants traveled more in general in that week, or whether walking was a temporary alternative to Car 0 that became less popular once the participants found other more desirable modes of transportation. It is clear, however, that the participants in general walked more in the test period than in the baseline. Walking increased in the test period compared to the baseline period by an average of 64 miles per week or 30%.

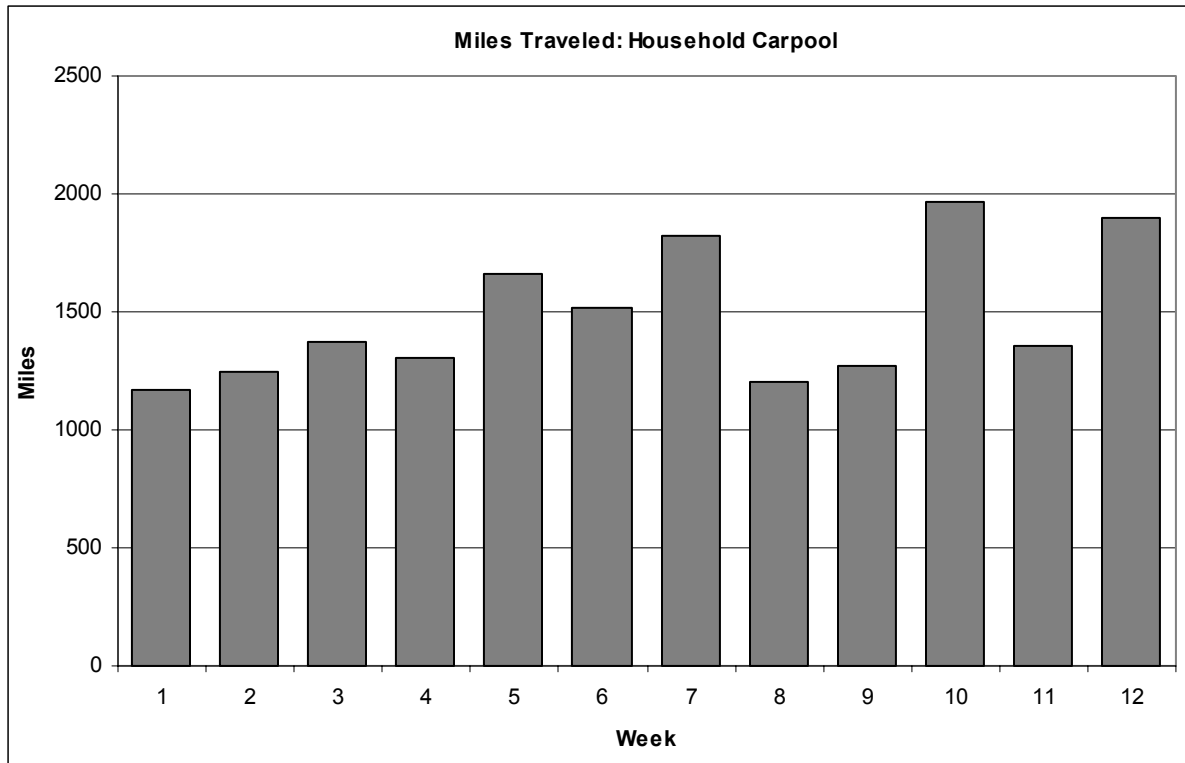


Figure 10: Miles Traveled, Household Carpool

Miles traveled in “household carpools” are recorded in Figure 10. For the purpose of the study, we defined “Household Carpool” as trips taken where a household member was the driver of a car, and one or more household members were passengers.

We do not include mileage of “Household Carpools” in our overall totals where the household member recording the trip was a passenger because we have the mileage of that trip as recorded by the household member who was driving included in the overall mileage totals. To include mileage for the same trip recorded by both the household member who is the driver and the household member who is the passenger would result in a double-count of the miles of that shared trip.

We defined “Non-Household Carpool” as a trip taken where the driver was not a household member, and a household member was a passenger. These miles we did include in the overall mileage totals.

We did not ask participants to record if a trip were taken where a household member was the driver, and a non-household member was a passenger. In this case, those trips were counted as a regular (non-carpool) car trip for the household member who was driving.

Using these definitions, “Household carpools” are not “true” carpools because they do not involve people from more than one household, and so these miles are not considered true carpool miles (which are shown in Figure 11).

However, it is clear that participants increased the use of these household carpools in the test period compared to the baseline period by an average of 292 miles per week or 23%.



Figure 11: Miles Traveled, Carpool (Non-household)

“Non-Household Carpool” ridership – where a non-household member is the driver, and a household member are a passenger – shows a modest change in the test period. While the usage trend of these more formal carpools is highly variable, the average of miles traveled in non-household carpools increased an average of 380 miles per week in the test period, or 29%.

(Note that “household carpools” – where the riders are also cohabitants – are displayed in Figure 10).

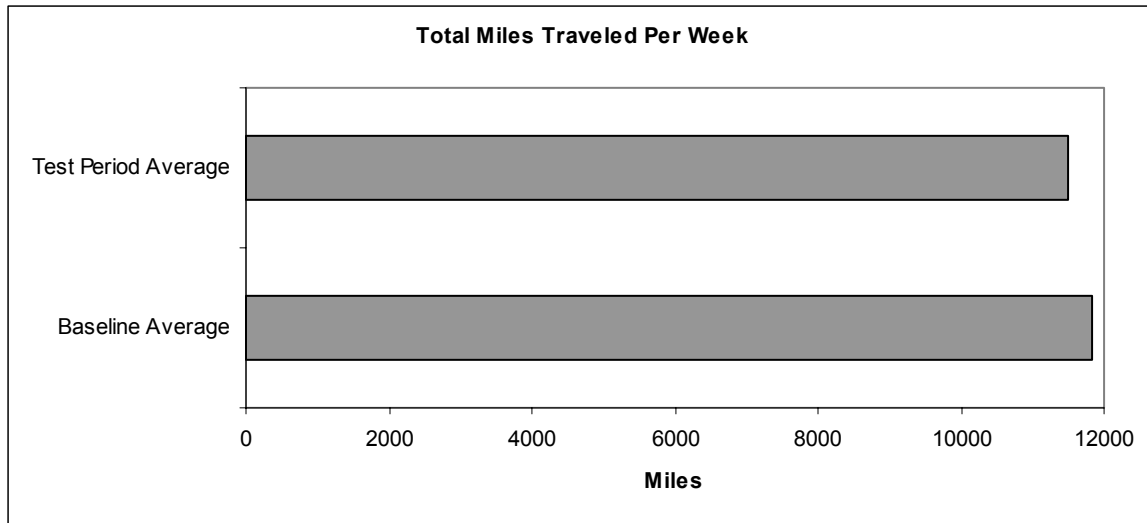


Figure 12: Miles Traveled per Week by All Modes, Baseline vs. Test Period

The chart above shows average weekly miles traveled by all modes. As you can see, there is virtually no reduction in the miles traveled per week in the test period as compared to the baseline, which means people continued to make all their same trips but used non-single occupant vehicle modes (SOV) more heavily. A decrease in total travel would be expected after the loss of the primary car, but participants' total travel decreased by only 3% when Car 0 was removed.

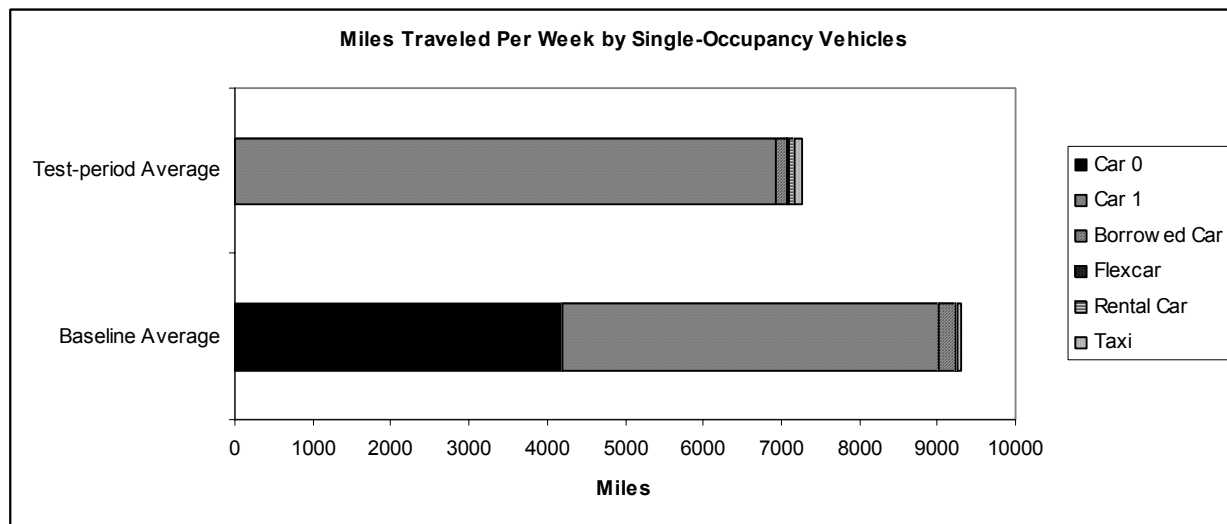


Figure 13: Miles Traveled Per Week by SOV, Baseline vs. Test Period

Single-occupancy vehicle (SOV) use dropped measurably in the test period compared to the baseline period, due primarily to the removal of Car 0. Figure 13 shows that Car 1 use increased dramatically in the test period, partially compensating for the lack of Car 0. However, the increased use of Car 1 and other SOV modes in the test period is still significantly less than all SOV modes – including Car 0 – in the baseline, indicating a real reduction took place. It is also clear from Figure 13 that the usage of Cars 0 and 1 dwarfed that of the other modes of single-occupancy vehicle transportation.

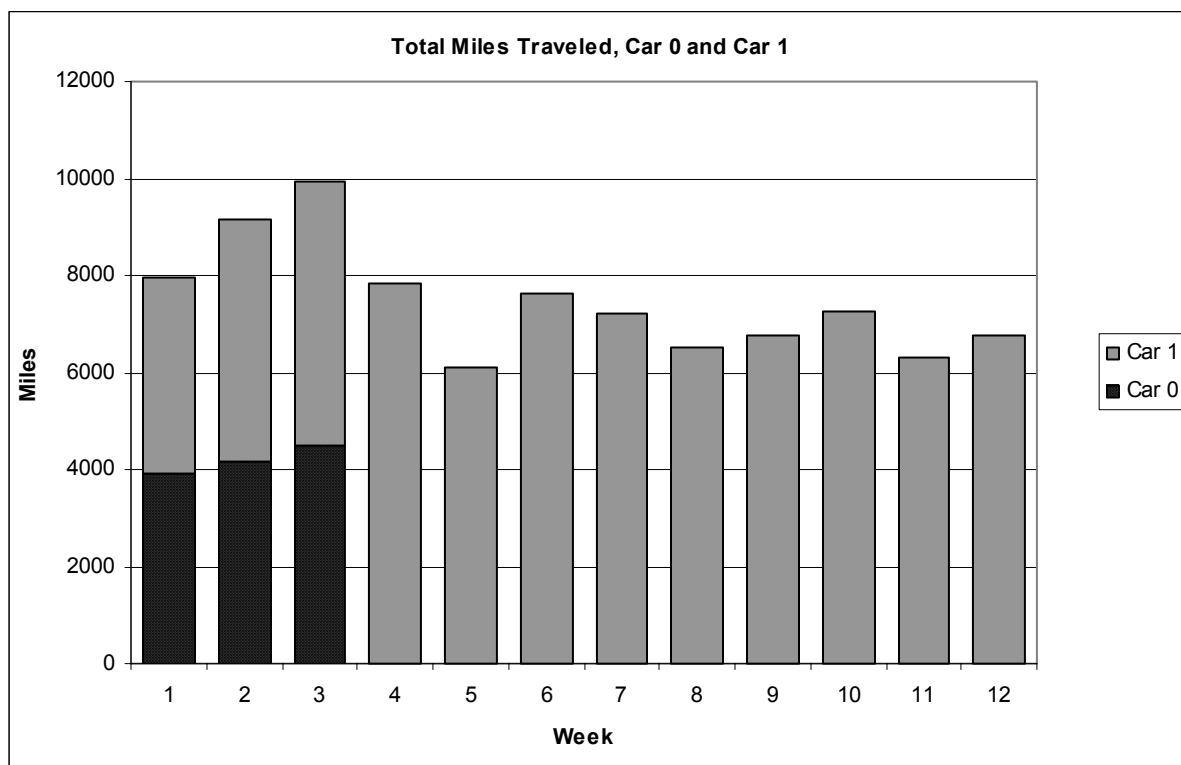


Figure 14: Total Miles Traveled, Car 0 and Car 1

Travel in “owned vehicles” (Car 0 and Car 1) is shown in Figure 14. While week 4 was the most heavily traveled week when all modes of transportation are accounted for, owned-vehicle usage dropped in week 4 with the removal of Car 0. Therefore, the increased mileage in Week 4 was not caused by use of Car 1 replacing the use of Car 0.

Car 1 usage did increase significantly in week 4 so that it almost equaled the total owned-vehicle usage in Week 1, and much, though not all, of Car 0 usage in the baseline period shifted to Car 1 in the test period. But the mileage numbers show the decrease in total Car 0 and Car 1 usage between the baseline and test periods. Participants drove their owned-vehicles an average of 220 miles per week per household in the baseline period, whereas in the test period, that number fell to 169 miles per week per household, representing a decrease of 23%.

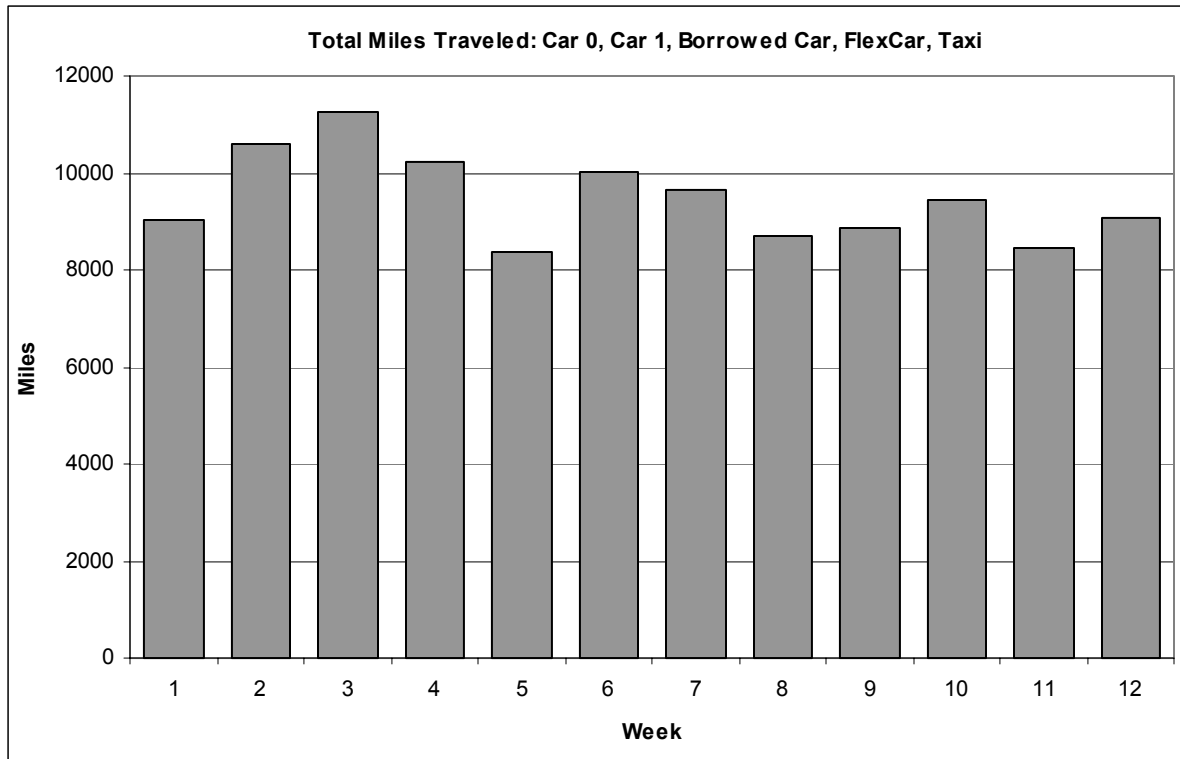


Figure 15: Total Miles Traveled by All SOV Modes

Total SOV automotive transportation (Car 0, Car 1, Borrowed Car, Flexcar, Taxi) is not very different from transportation by Car 0 and Car 1, due to the fact that the relative number of miles traveled by borrowed cars, Flexcar, and taxis are very small compared to the miles traveled in owned vehicles. Overall, all SOV usage dropped from 227 miles per week per household to 177 miles per week per household – a 22% decrease.

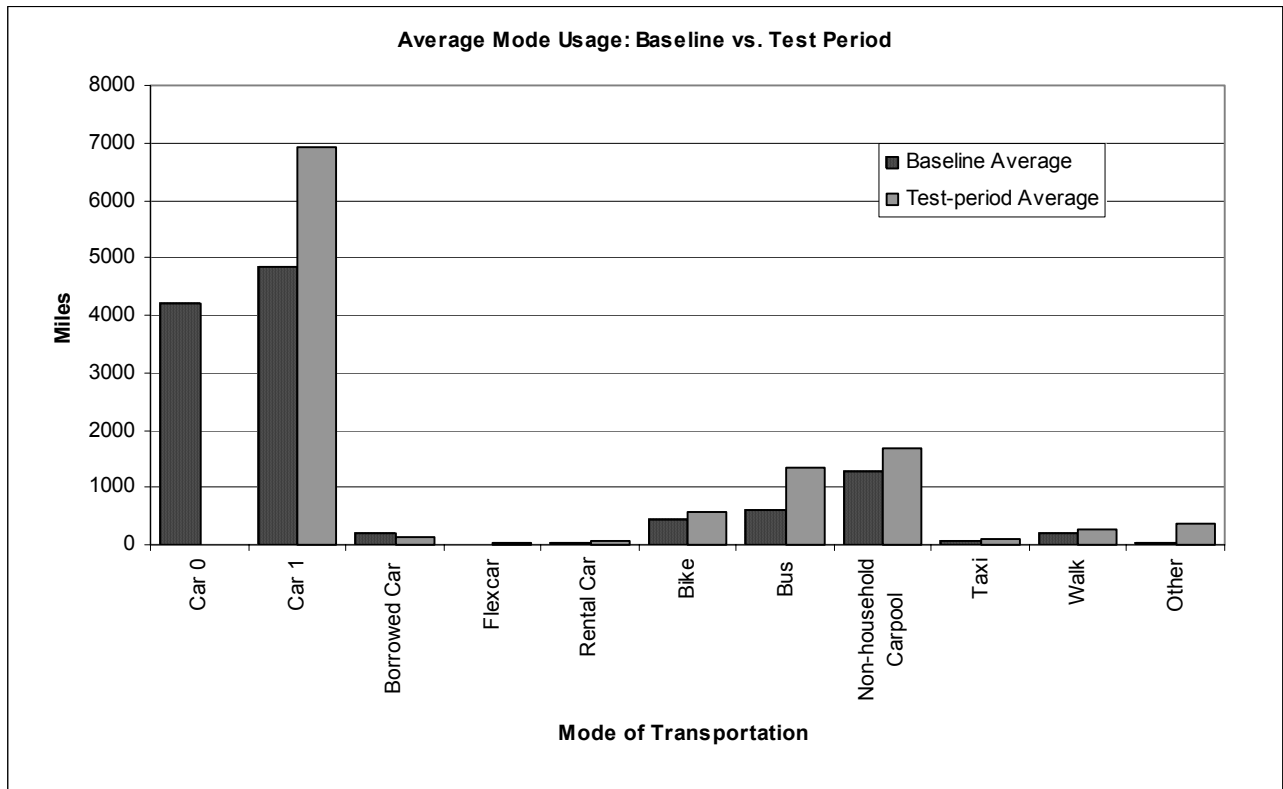


Figure 16: All Mode Usage, Baseline vs. Test Period

Figure 16 provides a convenient breakdown of transportation choices and how they changed between the baseline and the test period. Car 0 was driven only in the baseline period; Car 1 was used significantly more in the test period than in the baseline. Buses were also utilized significantly more in the test period. Most other modes of transportation also were utilized slightly more in the test period, the only exception being borrowed cars, which were actually used a slight amount less in the test period than in the baseline.

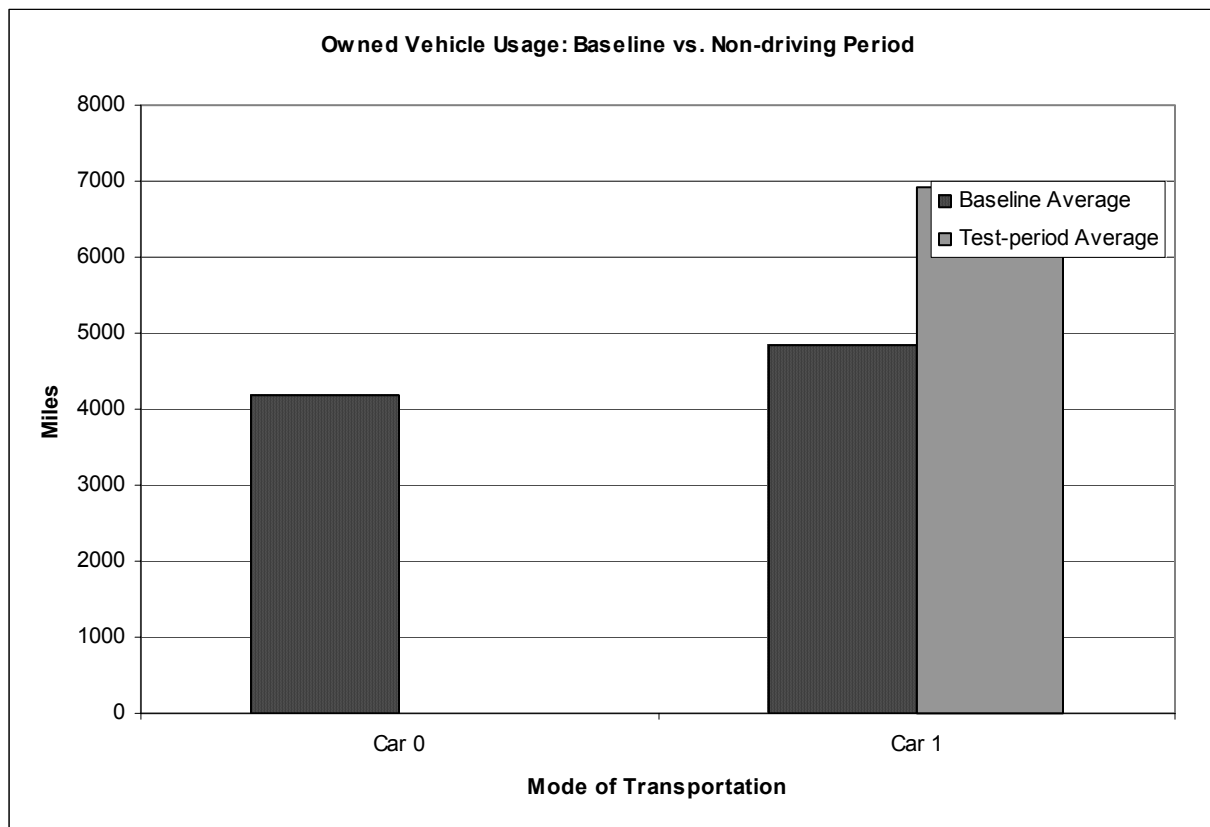


Figure 17: Owned-Vehicle Usage, Baseline vs. Test Period

Figure 17 offers a closer look at owned-vehicle usage in the baseline and test periods.

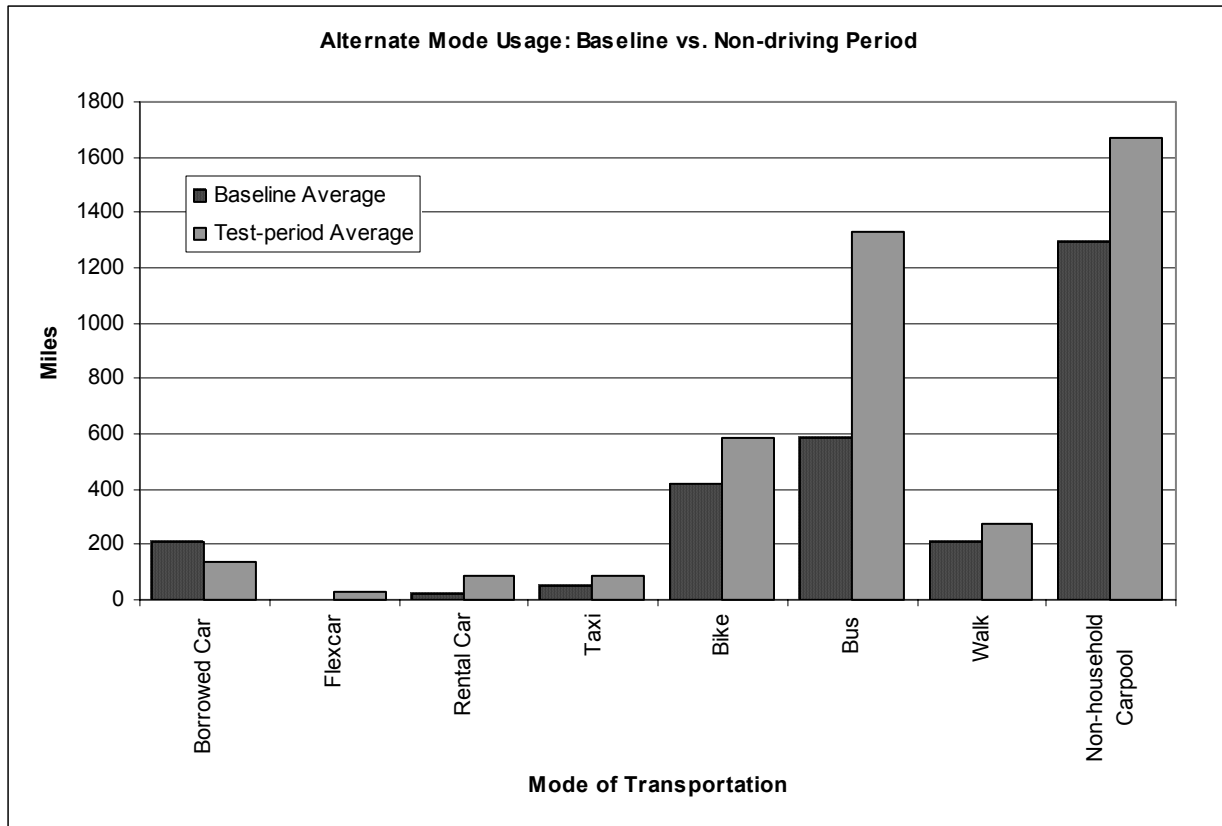


Figure 18: Alternate Mode Usage, Baseline vs. Test Period

Here we see the dramatic increase in bus usage in the test period, along with the more modest increases in formal carpool usage (Non-Household Carpool) and bicycling. It is also interesting to note that borrowed-car usage dropped in the test period, even though the participants had one fewer car during that period. Because of the relatively minimal mileage of this mode, this again shows how the decisions of one or two households greatly influence the total trend.

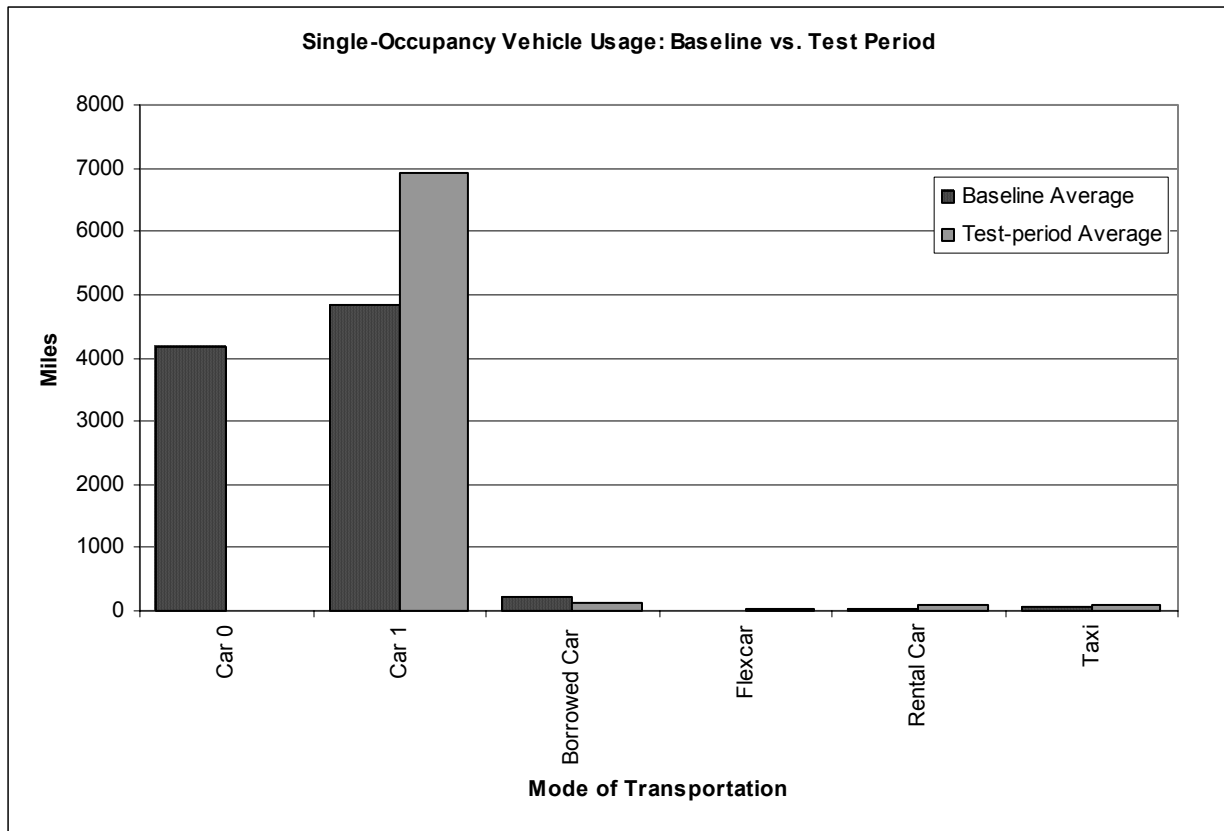


Figure 19: SOV Usage, Baseline vs. Test Period

This is a similar view of the data as Figure 13, but with this arrangement one can see how usage of individual modes changed between the baseline and test periods. While usage of borrowed cars decreased between the baseline and test periods, usage of all other single-occupancy vehicles increased (with the obvious exception of Car 0). This shift in vehicle usage partially mitigates the reduction in single-occupancy vehicle usage that is achieved when Car 0 is removed, though the increased use of Car 1 and other SOV modes in the test period is still significantly less than all SOV modes – including Car 0 – in the baseline, indicating a real reduction took place.

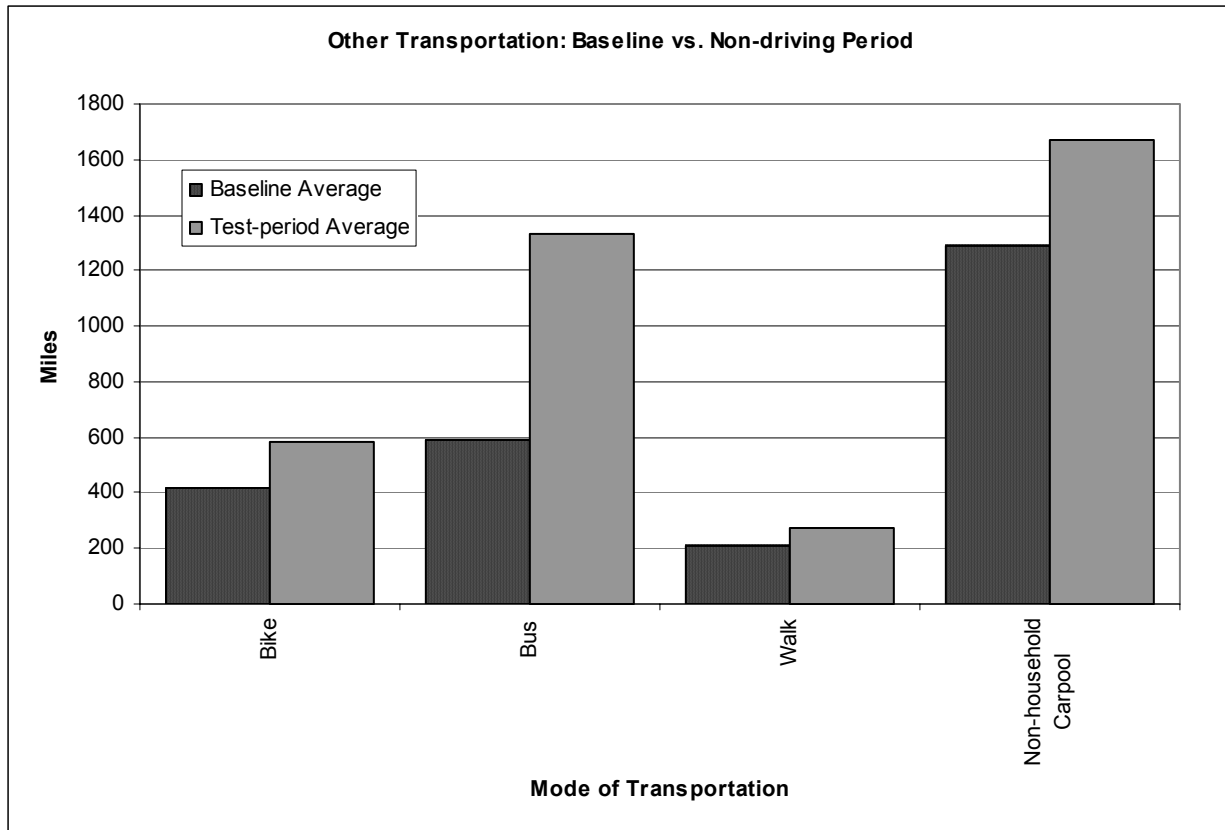


Figure 20: Non-SOV Usage, Baseline vs. Test Period

Usage of all non-SOV modes of transportation increased in the test period, as participants shifted their transportation usage to other modes of transportation after Car 0 was removed.

Analysis of Travel Behavior Influenced by Weather

Relevant Data

Weather as an additional variable involves complications that hinder a thorough and reliable statistical analysis. The City has requested an analysis of weather impacting travel behavior. But weather of any kind does not arrive in a 'weekly' pattern. The variations mean we cannot analyze the weekly data for weather impacts. Having said that, it is believed that if the study had extended into the winter, there would likely be a more noticeable correlation.

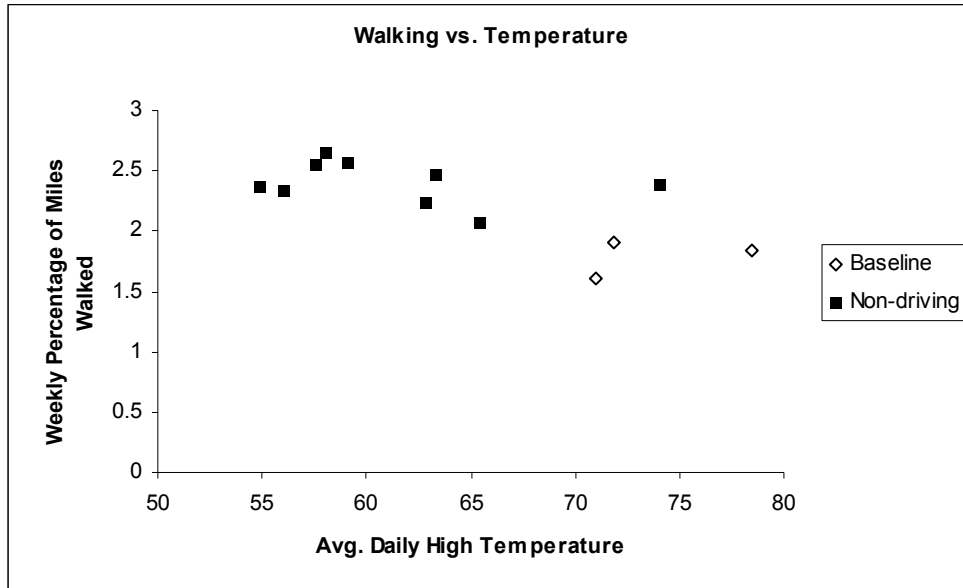


Figure 21: Walking vs. Temperature

In Figure 21, the total miles walked in a week are graphed against the average daily high temperature for the week, for both the baseline and non-driving periods. On average, people walked slightly more in the non-driving period when it was on average cooler, in the 55-65 degree range, than in the baseline, when it was in the 70-80 degree range.

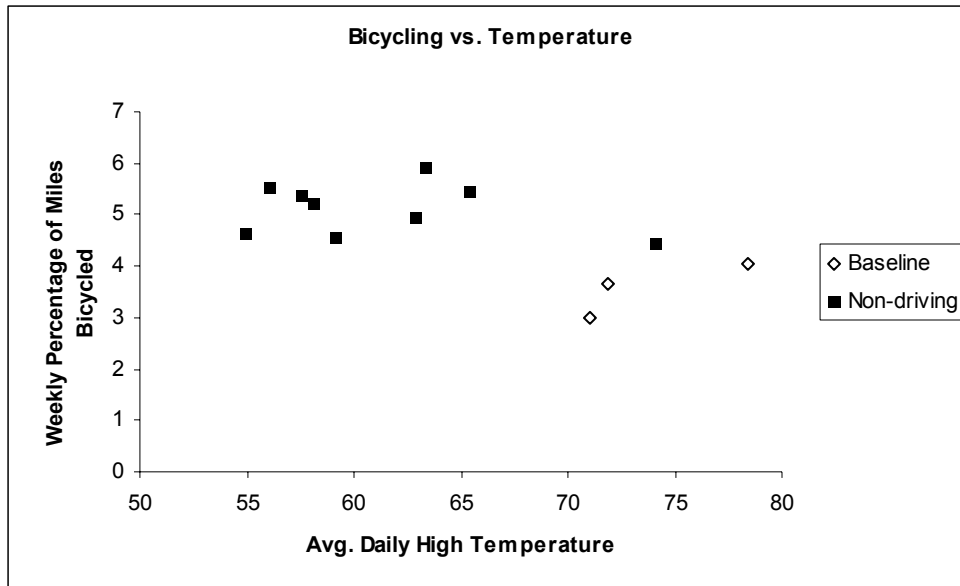


Figure 22: Bicycling vs. Temperature

In Figure 22, the total miles biked in a week are graphed against the average daily high temperature for the week, for both the baseline and non-driving periods. On average, people biked slightly more in the non-driving period when it was on average cooler, in the 55-65 degree range, than in the baseline, when it was in the 70-80 degree range.

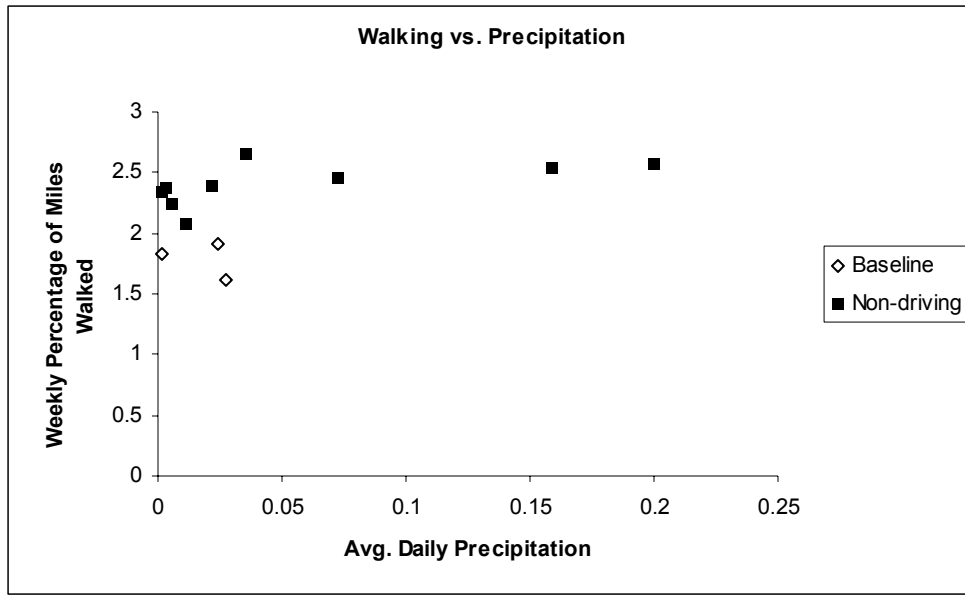


Figure 23: Walking vs. Precipitation

While temperature may not significantly affect one's decision to walk or take a bicycle, it might matter if it was raining or not. However, Figure 24 suggests that precipitation also did not have any significant effect on the total miles walked and that participants walked more in the test period than in the baseline, regardless of precipitation.

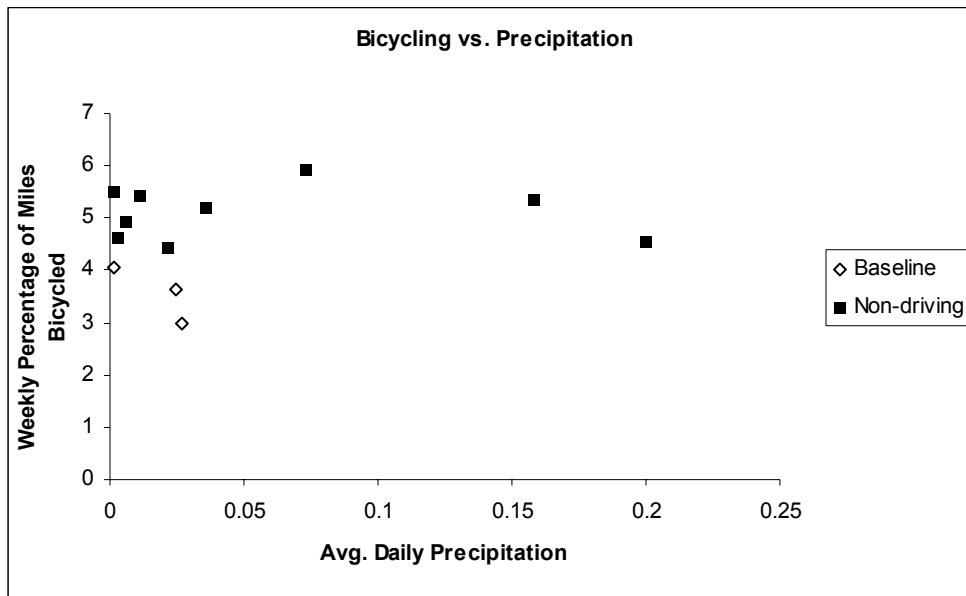


Figure 24: Bicycling vs. Precipitation

Likewise, bicycling did not seem to be affected by precipitation and participants used this method of transportation more during the test period than during the baseline, regardless of precipitation.

Analysis of Travel Behavior - Changes in Amount of Travel vs. Mode of Travel

Evaluation Questions and Anecdotal Information

One question that arises in the analysis of the participants' transportation choices is what effect the removal of Car 0 had on the *amount* traveled versus the *choice* of transportation mode – in other words, how much did the removal of Car 0 result in participants choosing to stop making some trips vs. choosing to go to the same places by different ways. It could be expected that participants would both travel less and choose different transportation modes after they had one less car.

In an effort to isolate the effect of the removal of Car 0 on the *choice* of transportation mode, a subset of participants¹ were chosen who “went the same places different ways” – people who did not reduce their travel when Car 0 was removed. The choices of these participants could then be interpreted as a measure of the effect of one less car on the *choice* of transportation mode.

In order for participants to be included in the “same places different ways” subset, their transportation behavior had to satisfy two criteria:

- (1) they must have made at least the same number of trips in the test period as they did in the baseline period, and
- (2) they must not have increased their total car utilization in the test period. Seventeen of the forty-one households satisfied these criteria, and their transportation choices are compared to those of the total participant pool in Figures 25 and 26.

¹ The 17 households who met the criteria in the 2002 study are: Alsheikh, Choder-Freedman, Christoffersen-Weber, Denucci, Dobrovolny-Salo, Goff, Gray-Kim, Kurtz, Lawrence, Montgomery, Nelson, Ogden, Ottoson-Lemberg, Picard, Sanem-Bjarko, Werner-O'Neill, and Williams-Summers.

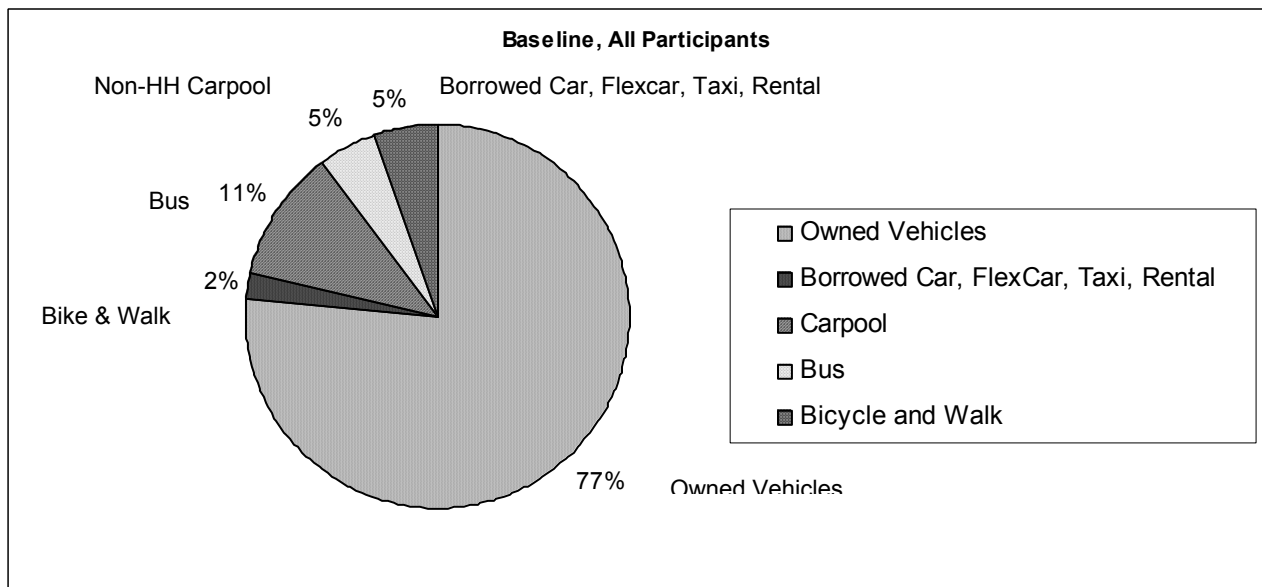
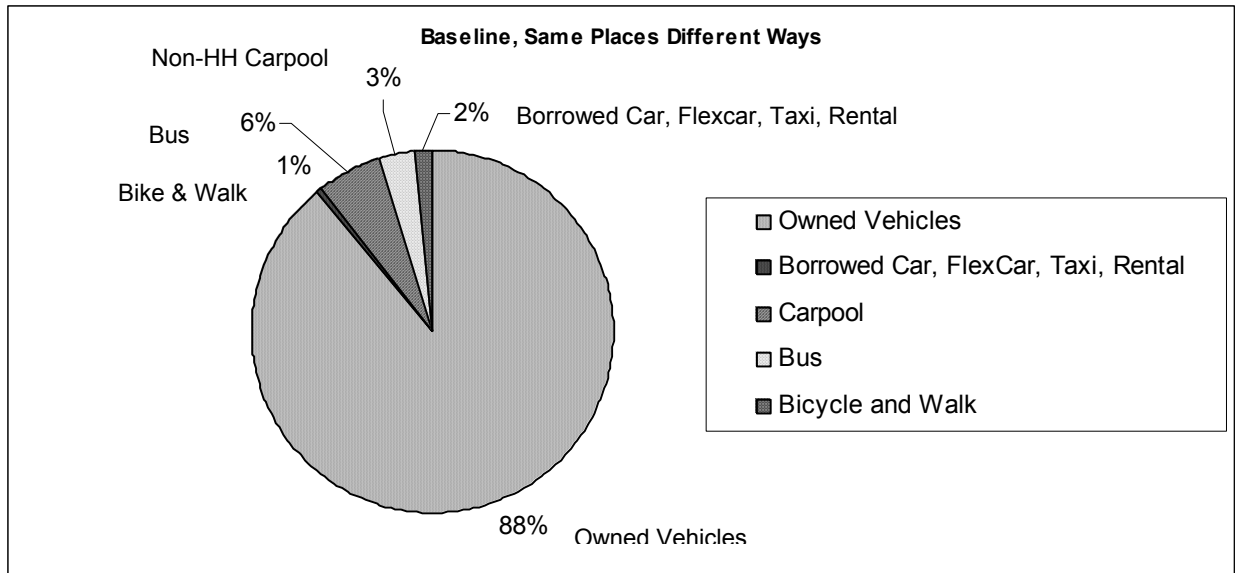


Figure 25: Transportation Choices, Participants Who Traveled “Same Places Different Ways”, Baseline vs. Test period

The participants who traveled the “same places different ways” used vehicles other than their owned vehicles about half as much in the baseline period as the total participant pool. But while their total usage of alternative vehicles was less, the “same places different ways” participants used alternative vehicles in about the same proportions as the participants as a whole during the baseline.

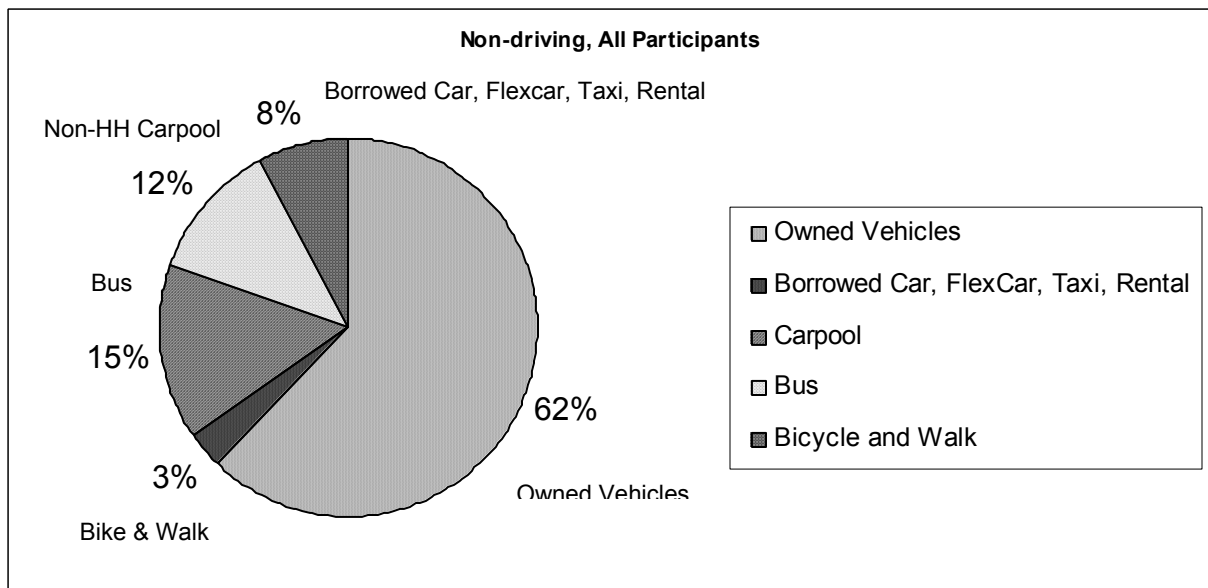
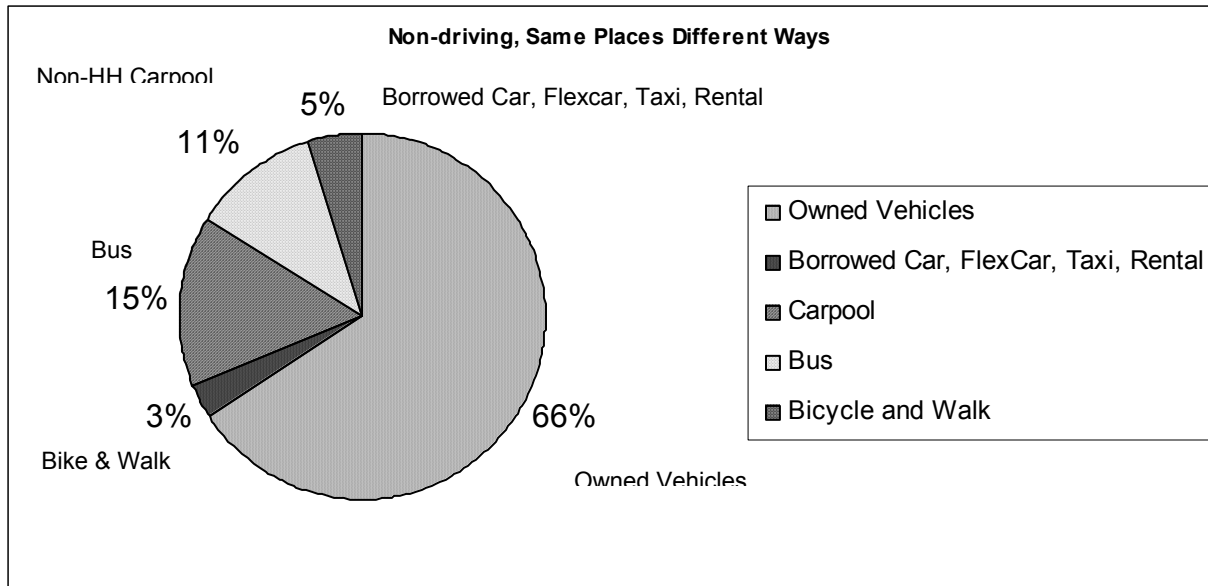


Figure 26: Transportation Choices, Participants Who Traveled “Same Places Different Ways”, Baseline vs. Test period

The test-period (non-driving) choices of the “same places different ways” participants were remarkably similar to those of the total participant pool, with the same relative increase in bus utilization. The fact that the “same places different ways” participants used their owned-vehicles so much in the baseline period indicates that removing Car 0 strongly shifts participants’ *choice* of transportation mode to alternative modes.

